Remarks

Claims 1-6, 8-21 and 44-61 are pending. Claims 45-61 are new. A clean copy of the claims as amended herein is attached for the convenience of the Examiner.

I. Indefiniteness Rejections:

The Examiner has rejected various claims as indefinite. Applicant has attempted to address the Examiner's concerns by amendment where the Examiner's point was understood.

However, some of the Examiner's rejections are not well founded. For example, as to some of the rejected claims, the Examiner opines that the circuitry elements are lacking a structural relationship to the other elements of the claim. But this isn't correct. Take claim 4 for example, which recites "the system of claim 1, further comprising current measuring circuitry for determining power consumption in the antenna/charging coil." Thus, claim 4 recites a new element in the claimed system (current measuring circuitry) which measures power consumption in an already-positively-cited limitation (the antenna/charging coil). Thus, the new circuitry is properly tied back to the already-claimed system, and accordingly there is no lack of a structural relationship.

Applicant honestly wants to address the Examiner's concerns. Therefore, if the Examiner is inclined to continue to reject claims for indefiniteness, it is respectfully requested that the Examiner make clear, through specific citation to the claim language, the concerns he has. Once understood, the Applicant will attempt to address any valid concerns. But right now, it appears to the Applicant that the claim limitations are all properly related, and do not recite mere "listing of parts."

II. Prior Art Rejections:

In responding to the Examiner's prior art rejections, Applicant here only justifies the patentability of the independent claims (i.e., claims 1 and 45). As the Examiner will appreciate, should the independent claims be patentable over the prior art, narrower dependent claims would

also necessarily be patentable. Accordingly, Applicant does not separately discuss the patentability of the dependent claims, although it reserves the right to do so at a later time if necessary.

Claim 1:

Claim 1 has been rejected as anticipated by U.S. Patent Application Publication 2003/0078634 ("Schulman").

Claim 1 has been amended to recite, in addition to the antenna/charging coil and its associated circuitry:

> "a booster coil coupled to the base station that is used to recover the rechargeable battery when is it depleted to zero volts, wherein the booster coil is different from the antenna/charging coil; and
> third circuitry for driving the booster coil, wherein the third circuitry is different from the first circuitry"

The concept of an additional booster coil was previous claimed in claim 7 (now canceled). The Examiner rejected claim 7, stating that Schulman included a second coil capable of performing zero-volt recovery, and pointing to Figures 4-6 of Schulman. Schulman discloses

> "[a] full-body charger for charging one or more battery-powered devices wherein such devices are configured for implanting beneath a patient's skin for the purpose of tissue . . . stimulation and/or parameter monitoring and/or data communication. Devices in accordance with the invention include a support structure, typically chair-shaped or bed-shaped, capable of supporting a patient's body while providing a magnetic field to one or more of the implanted devices using one or more coils mounted within for providing power to the implanted devices."

Schulman, Abstract. Consistent with this description, Schulman discloses in Figures 4-6 various devices (a chair; a bed; etc.) having a plurality of different charging coils 158.

However, these changing coils are all the same, and apparently are driven by equivalent circuits. This is not what Applicant claims. As noted above, Applicant's claimed booster coil is distinct from the claimed antenna/charging coil. Further, the claimed "third circuit" which drives Applicant's booster coil is distinct from the claimed "first circuitry" which drives the antenna/charging coil when used as a charging coil. The distinct nature of the booster coil and

its driving circuitry is made explicit in claim 1 ("wherein the booster coil is different from the antenna/charging coil"; "wherein the third circuitry is different from the first circuitry").

This distinction between the coils in Schulman is not disclosed. Furthermore, it is certainly not suggested to one or ordinary skill in the art, because the whole point of Schulman's device is that any of his identical coils 158 can be used to charge a particular implant depending on that implant's location. It is therefore specifically desired by Schulman that all of his coils, and their associated driving circuitry, be exactly the same.

Because these newly-added limitations to claim 1 are not disclosed in or suggested by Schulman, Schulman does not render claim 1 (or claims dependent thereon) unpatentable.

Claim 45:

Claim 45 is new, and essentially comprises the subject matter of old claim 21, including the following limitations:

> "a sensor external to the implantable stimulator for detecting power levels in the antenna/charging coil; and
> a variable output power supply contained within the base station that automatically adjusts downwards when the sensor detects power levels that exceed a predetermined level."

The Examiner was of the opinion that these limitations were disclosed in paragraph [0026] of Schulman. Applicant disagrees. Paragraph [0026] is recited in full below:

> "In a typical application (see FIG. 3A), a plurality of such devices 100, e.g., microstimulators, are implanted under the skin 12 of a patient's body and simultaneously subjected to an alternating magnetic field 154 from the external power source 118. Accordingly, once the charging circuit 122 determines that battery 104 has been sufficiently charged, the charging circuit 122 preferably detunes coil 116, e.g., by shunting out center tap 126 (or adding a capacitor across the coil), and thus minimizes any heat generation in the charging circuit 122 or any detrimental effects to the battery 104 from overcharging (including heat generation). Thus, the external power source 118 can continue to provide charging power via an alternating magnetic field indefinitely. However in one preferred embodiment, the external power source periodically polls the implanted devices for status information and continues to provide charging power until it has received status information from each of the implanted devices 100 that its battery

> 104 is charged (or at least those devices within its operational, i.e., communication/charging, range)."

Schulman, ¶ [0026]. This paragraph discloses two concepts: First, the charging circuitry 122 in the implant can assess the battery level during charging, and shunt out its coil so that continuous operation of the external power source 118 will not adversely affect the implant; Second, that the external power source 118 can poll the implant for battery status, and continue to provide power until the battery is full.

Neither of these concepts are pertinent to the limitations cited above, i.e., "a sensor external to the implantable stimulator for detecting power levels in the antenna/charging coil; and a variable output power supply contained within the base station that automatically adjusts downwards when the sensor detects power levels that exceed a predetermined level."

First, this paragraph of Schulman discloses no sensor "external to the implantable stimulator." The charging circuit 122 in Schulman is internal to the implantable stimulator. Additionally, this sensor does not detect power levels in the antenna/charging coil; it merely detects the battery voltage in Schulman's implant. In fact, nothing in Schulman detects the power level in the coil to make adjustment in light of a power level threshold.

Accordingly, claim 45 (and claims dependent thereon) are patentable over Schulman.

* * * * *

Based on the above remarks, Applicant respectfully submits that pending claims 1-6, 8-21 and 44-61 are allowable, and requests that a Notice of Allowance issue for these claims.

Respectfully submitted,

/ TGL /

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Clean Copy of Claims with Amendments Incorporated

for the Convenience of the Examiner

1. (currently amended) A system for recharging and communicating with an implantable stimulator having a rechargeable battery comprising:

a base station;

an antenna/charging coil coupled to the base station that is used to inductively charge the rechargeable battery within the implantable stimulator and to transcutaneously communicate with the stimulator;

first circuitry for driving the antenna/charging coil with a charging signal when used as a charging coil;

second circuitry for driving the antenna/charging coil with a communication signal when used as a communication coil;

a booster coil coupled to the base station that is used to recover the rechargeable battery when is it depleted to zero volts, wherein the booster coil is different from the antenna/charging coil; and

third circuitry for driving the booster coil, wherein the third circuitry is different from the first circuitry.

2. (currently amended) The system of claim 1,

wherein the second circuitry accomplishes forward and backward frequency shift keying (FSK) telemetry with the implantable stimulator,

wherein the antenna/charging coil is configured and dimensioned to enable FSK telemetry.

3. (currently amended) The system of claim 2,

wherein the second circuitry accomplishes forward on-off keying (OOK) telemetry with the implantable stimulator using the antenna/charging coil.

4. (currently amended) The system of claim 1, further comprising:

current measuring circuitry for determining power consumption in the antenna/charging coil.

5. (currently amended) The system of claim 1, further comprising:

a printed circuit board (PCB) coupled to the antenna/charging coil and to the booster coil; and

sensing circuitry for sensing temperature included on the PCB.

6. (currently amended) The system of claim 5, further comprising:

automatic power shut-off circuitry for automatically shutting off power to the antenna/charging coil when the sensed temperature through the antenna/charging coil exceeds a predetermined level.

7. (canceled)

8. (currently amended) The system of claim 1, wherein the booster coil has a plurality of turns of wire in a plurality of layers wrapped around a coil spool.

9. (currently amended) The system of claim 1, further comprising:

power sensing circuitry for determining power consumption in the booster coil; and

automatic power shut-off circuitry for automatically shutting off power to the booster coil when the power consumption through the booster coil exceeds a predetermined power level.

10. (currently amended) The system of claim 1, further comprising:

a chair pad coupled to the base station;

a printed circuit board (PCB) contained in the chair pad;

sensing circuitry for sensing temperature included on the PCB; and

automatic power shut-off circuitry for automatically shutting off power to the booster coil when the sensed temperature exceeds a predetermined power level.

11. (currently amended) The system of claim 1, wherein the antenna/charging coil has a plurality of turns of wire wrapped around a coil spool.

12. (currently amended) The system of claim 10 wherein the chair pad is further comprised of:

a compliant housing made of foam; and

a coil assembly housing which contains the booster coil, the antenna/charging coil and the PCB,

wherein the foam housing encapsulates the coil assembly housing.

13. (currently amended) The system of claim 12, wherein the chair pad is further comprised of:

an exterior slipcover that surrounds the housing.

14. (currently amended) The system of claim 1,

wherein the booster coil is placed in a coil assembly with the antenna/charger coil, wherein the booster coil and antenna coil are wound over a spool coil in a configuration to present at least one substantially flat side;

wherein the coil assembly is fully encapsulated in an external housing.

15. (currently amended) The system of claim 14, wherein the housing is foam.

16. (previously presented) The system of claim 10, further comprising:

a chair pad cable that connects the chair pad to the base station; and

detection circuitry for automatically detecting disconnection of the chair pad cable from the chair pad.

17. (currently amended) The system of claim 1, wherein the base station includes:

a speaker for generating an audible sound to signal a system event.

18. (currently amended) The system of claim 1,

wherein the first circuitry is impedance matched to the antenna/charging coil with a first impedance matching network; and

wherein the third circuitry is impedance matched to the booster coil with a second impedance matching network.

19. (original) The system of claim 18, wherein the first impedance matching network is a 50 Ohm matching network and the second impedance matching network is a 50 Ohm matching network.

20. (currently amended) The system of claim 1, wherein the system includes the implantable stimulator, and wherein the implantable stimulator is a microstimulator having a maximum length-wise dimension of about 3.5 centimeters and a maximum width of about 5 millimeters.

21. (currently amended) The system of claim 1, further comprising:

a sensor for detecting power levels in the antenna/charging coil; and

a variable output power supply that automatically adjusts downwards when the sensor detects power levels that exceed a predetermined level,

wherein the variable output power supply is contained within the base station.

22-43. (canceled)

44. (currently amended) The system of claim 4, further comprising:

automatic power shut-off circuitry for automatically shutting off power to the antenna/charging coil when the power consumption through the antenna/charging coil exceeds a predetermined level.

45. (new) A system for recharging and communicating with an implantable stimulator having a rechargeable battery comprising:

a base station;

an antenna/charging coil coupled to the base station that is used to inductively charge the rechargeable battery within the implantable stimulator and to transcutaneously communicate with the stimulator;

first circuitry for driving the antenna/charging coil with a charging signal when used as a charging coil;

second circuitry for driving the antenna/charging coil with a communication signal when used as a communication coil;

a sensor external to the implantable stimulator for detecting power levels in the antenna/charging coil; and

a variable output power supply contained within the base station that automatically adjusts downwards when the sensor detects power levels that exceed a predetermined level.

46. (new) The system of claim 45,

wherein the second circuitry accomplishes forward and backward frequency shift keying (FSK) telemetry with the implantable stimulator,

wherein the antenna/charging coil is configured and dimensioned to enable FSK telemetry.

47. (new) The system of claim 46,

wherein the second circuitry accomplishes forward on-off keying (OOK) telemetry with the implantable stimulator using the antenna/charging coil.

48. (new) The system of claim 45, further comprising:

current measuring circuitry for determining power consumption in the antenna/charging coil.

49. (new) The system of claim 48, further comprising:

automatic power shut-off circuitry for automatically shutting off power to the antenna/charging coil when the power consumption through the antenna/charging coil exceeds a predetermined level.

50. (new) The system of claim 45, further comprising:

a printed circuit board (PCB) coupled to the antenna/charging coil; and

sensing circuitry for sensing temperature included on the PCB.

51. (new) The system of claim 50, further comprising:

automatic power shut-off circuitry for automatically shutting off power to the antenna/charging coil when the sensed temperature through the antenna/charging coil exceeds a predetermined level.

52. (new) The system of claim 45, wherein the antenna/charging coil has a plurality of turns of wire wrapped around a coil spool.

53. (new) The system of claim 45, further comprising a chair pad that is comprised of:

a compliant housing made of foam; and

a coil assembly housing which contains the antenna/charging coil and a chair pad PCB,

wherein the foam housing encapsulates the coil assembly housing.

54. (new) The system of claim 53, wherein the chair pad is further comprised of:
an exterior slipcover that surrounds the housing.

55. (new) The system of claim 53, further comprising:
a chair pad cable that connects the chair pad to the base station; and
detection circuitry for automatically detecting disconnection of the chair pad cable from the chair pad.

56. (new) The system of claim 45, further comprising:
a booster coil that is placed in a coil assembly with the antenna/charger coil, wherein the booster coil and antenna coil are wound over a spool coil in a configuration to present at least one substantially flat side;
wherein the coil assembly is fully encapsulated in an external housing.

57. (new) The system of claim 56, wherein the housing is foam.

58. (new) The system of claim 45, wherein the base station includes:
a speaker for generating an audible sound to signal a system event.

59. (new) The system of claim 45,
wherein the first circuitry is impedance matched to the antenna/charging coil with a first impedance matching network.

60. (new) The system of claim 59, wherein the first impedance matching network is a 50 Ohm matching network.

61. (new) The system of claim 45, wherein the system includes the implantable stimulator, and wherein the implantable stimulator is a microstimulator having a maximum length-wise dimension of about 3.5 centimeters and a maximum width of about 5 millimeters.